AMENDMENT TO THE CLAIMS:

1. (Currently amended) A method of baseband digital modulation for a data transmission system wherein a plurality of data symbols is transmitted over a transmission channel at a symbol rate; said method comprising the steps of:

generating a plurality of inphase (I) and quadrature (Q) components of symbols by mapping an input bit stream comprising a plurality of digital codewords into a QAM constellation;

bandlimiting, quantizing, interpolating, and pre-compensating said I and Q components of ~~said~~ a digital signal for a sync (*sinx/x*) function amplitude roll off by utilizing a Polyphase filter at a baseband frequency;

converting ~~said~~ a plurality of digital symbols into an analog signal by using a D/A converter in each ~~said~~ I and Q channels separately;

prefiltering by a lowpass analog antialiasing prefilter ~~said~~ an I analog signal in ~~said~~ an I channel, and ~~said~~ an Q analog signal in ~~said~~ a Q channel separately;

and

complexly combining said I component and said Q component of said analog signal by an (I/Q) modulator to generate a real analog RF signal at an interpolated sampling rate.

2. (Original) The method of claim 1, wherein said step of bandlimiting, interpolating, and pre-compensating said plurality of said symbols by utilizing said Polyphase filter in each said I and Q channels separately at baseband

frequency further includes the step of:

interpolating at a sampling rate twice the symbol rate.

3. (Original) The method of claim 1, wherein said step of bandlimiting,

interpolating, and pre-compensating said plurality of said symbols by utilizing

said Polyphase filter in each said I and Q channels separately at baseband

frequency further includes the step of:

interpolating at a sampling rate four times the symbol rate.

4. (Original) The method of claim 1, wherein said step of bandlimiting,

interpolating, and pre-compensating said plurality of said symbols by utilizing

said Polyphase filter in each said I and Q channels separately at baseband

frequency further includes the step of:

interpolating at a sampling rate eight times the symbol rate.

5. (Original) The method of claim 1, wherein said step of bandlimiting,

interpolating, and pre-compensating said plurality of said symbols by utilizing

said Polyphase filter in each said I and Q channels separately at baseband

frequency further includes the step of:

interpolating at a sampling rate N times the symbol rate, wherein N is an

integer.

6. (Original) The method of claim 1, wherein said step of bandlimiting,

quantizing, interpolating, and pre-compensating said I and Q components of

said digital signal for said sync (*sinx/x*) function amplitude roll off further

includes the step of:

introducing a predistortion correction error signal in each said I and Q

channels separately in order to pre-compensate for a further compression by a

5   High Power Amplifier (HPA).

7. (Original) The method of claim 6 further including the step of:

periodically re-calibrating for an analog drift of said I/Q amplitude

imbalance, for an analog drift of said I/Q phase imbalance, and for an analog

10   drift of said DC offset caused by changes in outside temperature, and caused

by aging of electronic components.

8. (Currently Amended) A method of passband digital modulation for a data

transmission system wherein a plurality of data symbols is transmitted over a

15   transmission channel at a symbol rate; said method comprising the steps of:

generating a plurality of I and Q components of symbols by mapping an

input bit stream comprising a plurality of digital codewords into a QAM

constellation;

bandlimiting, quantizing, and interpolating said plurality of symbols by

20   utilizing a Polyphase filter at a passband IF frequency;

pre-compensating said I and Q components of ~~said~~ a̲ digital signal having

~~said~~ a̲n̲ IF carrier signal for a sync (*sinx/x*) function amplitude roll off caused

by an output D/A converter by using a complex shaping filter;

upconverting said I and said Q components of the digital signal to a RF

carrier via a digital complex multiplier and discarding ~~said~~ a Q output

component of said digital signal;

converting ~~said~~ <u>an</u> I output component into an analog RF output signal

using said output D/A converter;

5   and

filtering out images of ~~said~~ <u>a</u> real output RF analog signal by using a

lowpass analog reconstruction filter.

9. (Original) The method of claim 8, wherein said step of bandlimiting,

10   quantizing, and interpolating said plurality of symbols at said passband IF

frequency further includes the step of:

interpolating at a sampling rate four times the symbol rate, wherein said

IF frequency is equal to a symbol rate frequency.

15   10. (Original) The method of claim 8, wherein said step of bandlimiting,

quantizing, and interpolating said plurality of symbols at said passband IF

frequency further includes the step of:

interpolating at a sampling rate eight times the symbol rate, wherein said

IF frequency is twice a symbol rate frequency.

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11. (Original) The method of claim 8, wherein said step of bandlimiting,

quantizing, and interpolating said plurality of symbols at said passband IF

frequency further includes the step of:

interpolating at a sampling rate equal to N times the symbol rate,

wherein said IF frequency is equal to N/2 times a symbol rate frequency, wherein N is an integer.

12. (Original) The method of claim 8, wherein said step of bandlimiting,

5   quantizing, and interpolating said plurality of symbols at said passband IF frequency further includes the step of:

introducing a predistortion correction error signal in each said I and Q channels separately in order to pre-compensate for a further compression by a High Power Amplifier (HPA).

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13. (Original) The method of claim 8 further including the steps of:

compensating for I/Q amplitude imbalance by using an I/Q amplitude gain block in said I channel and by using an I/Q amplitude gain block in said Q channel;

15   compensating for I/Q phase imbalance by using a quadrature error complex multiplier in order to change a phase relationship between I and Q components;

and

compensating for a DC offset by adding an equal amount of opposite

20   polarity DC offset in each said I and Q channels.

14. (Canceled)

15. (Canceled)

16. (Canceled)

17. (Currently amended) ~~The method of claim 15, wherein said step of selecting said passband or said baseband mode further includes the step of:~~

A method of baseband/passband digital modulation for a data transmission system wherein a plurality of data symbols is transmitted over a

5   transmission channel at a symbol rate; said method comprising the steps of:

generating a plurality of I and Q components of symbols by mapping an input bit stream comprising a plurality of digital codewords into a QAM constellation;

if said QAM constellation includes less than 64 QAM plant points,

10   initially selecting ~~said~~ a passband mode until a D/A conversion speed reaches a maximum passband conversion speed, and until an output symbol rate reaches a maximum passband symbol output rate, and subsequently switching to ~~said~~ a baseband mode in order to double said maximum passband conversion speed and to double said maximum passband symbol output rate;

15   and

generating an analog output signal in said passband or baseband mode.

18. (Currently amended) ~~The method of claim 14~~ A method of baseband/passband digital modulation for a data transmission system wherein a

20   plurality of data symbols is transmitted over a transmission channel at a symbol rate; said method comprising the steps of:

generating a plurality of I and Q components of symbols by mapping an input bit stream comprising a plurality of digital codewords into a QAM constellation;

selecting a passband or a baseband mode;

and

generating an analog output signal in said passband or baseband mode;

wherein if said baseband mode is selected, said step of generating said analog

5   output signal further includes the steps of:

converting said plurality of digital symbols into an analog signal by

using a D/A converter in each said I and Q channels separately;

prefiltering by a lowpass analog antialiasing prefilter each said

analog signal in each said I and Q channels separately;

10   and

complexly combining said I component and said Q component of

said analog signal to generate a real analog RF signal at an interpolated

sampling rate.

15   19. (Original) The method of claim 18, wherein in said baseband mode said

step of generating said analog output signal further includes the steps of:

complexly upconverting and combining said I and Q components of said

digital signal to generate an analog RF signal at an interpolated sampling rate,

and

20   filtering out images of said real output RF analog signal by using a

lowpass analog reconstruction filter.

20. (Currently amended) ~~The method of claim 14~~ A method of baseband/

passband digital modulation for a data transmission system; wherein a plurality

of data symbols is transmitted over a transmission channel at a symbol rate;

said method comprising the steps of:

generating a plurality of I and Q components of symbols by mapping an

input bit stream comprising a plurality of digital codewords into a QAM

5   constellation;

selecting a passband or a baseband mode;

and

generating an analog output signal in said passband or baseband mode;

said step of selecting said passband mode or said passband mode further

10   including the following steps:

bandlimiting, quantizing, and interpolating said plurality of

symbols by utilizing a Polyphase filter in each said I and Q channels separately

at a passband IF frequency;

introducing a predistortion correction error signal in each said I

15   and Q channels separately in order to pre-compensate for a further compression

by a High Power Amplifier (HPA);

pre-compensating said I and Q components of said digital signal

having said IF carrier signal for a sync (*sinx/x*) function amplitude roll off

caused by an output D/A converter by using a complex shaping filter;

20   upconverting said I and said Q components of the digital signal to

a RF carrier via a digital complex multiplier and discarding said Q output

component of said digital signal;

converting said I output component into an analog RF output signal

using said output D/A converter;

and

filtering out images of said real output RF analog signal by using a lowpass analog reconstruction filter.

5   21. (Currently Amended) An apparatus for baseband digital modulation for a data transmission system wherein a plurality of data symbols is transmitted over a transmission channel at a symbol rate; said apparatus comprising:

a means for generating a plurality of inphase (I) and quadrature (Q) components of symbols by mapping an input bit stream comprising a plurality

10   of digital codewords into a QAM constellation;

a means for bandlimiting, quantizing, interpolating, and pre-compensating said I and Q components of ~~said~~ a̲ digital signal for a sync (*sinx/x*) function amplitude roll off at a baseband frequency;

a means for converting ~~said~~ a̲ plurality of digital symbols into an analog

15   signal;

a means for prefiltering ~~said~~ a̲n I analog signal in ~~said~~ a̲n I channel, and ~~said~~ a̲ Q analog signal in ~~said~~ a̲ Q channel separately;

and

a means for complexly combining said I component and said Q

20   component of said analog signal to generate a real analog RF signal at an interpolated sampling rate.

22. (Original) The apparatus of claim 21, wherein said means for interpolating said I and Q components of said digital signal further includes:

a means for interpolating at a sampling rate four times the symbol rate.

23. (Original) The apparatus of claim 21, wherein said means for interpolating said I and Q components of said digital signal further includes:

5   a means for interpolating at a sampling rate eight times the symbol rate.

24. (Original) The apparatus of claim 21, wherein said means for interpolating said I and Q components of said digital signal further includes:

a means for interpolating at a sampling rate equal to N times the symbol

10   rate, wherein N is an integer.

25. (Original) The apparatus of claim 21 further including:

a means for pre-compensating for a further compression by a High Power Amplifier (HPA).

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26. (Original) The apparatus of claim 21 further including:

a means for periodically re-calibrating for an analog drift of said I/Q amplitude imbalance, for an analog drift of said I/Q phase imbalance, and for an analog drift of said DC offset caused by changes in outside temperature, and

20   caused by aging of electronic components.

27. (Currently amended) An apparatus for passband digital modulation for a data transmission system wherein a plurality of data symbols is transmitted over a transmission channel at a symbol rate; said apparatus comprising:

a means for generating a plurality of I and Q components of symbols by mapping an input bit stream comprising a plurality of digital codewords into a QAM constellation;

a means for bandlimiting, quantizing, and interpolating ~~said~~ a plurality of

5   symbols at a passband IF frequency;

a means for pre-compensating said I and Q components of ~~said~~ a digital signal having ~~said~~ an IF carrier signal for a sync (*sinx/x*) function amplitude roll off;

a means for upconverting said I and said Q components of the digital

10   signal to a RF carrier;

a means for converting said I output component into an analog RF output signal;

and

a means for filtering out images of ~~said~~ a real output RF analog signal;

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28. (Original) The apparatus of claim 27, wherein said means for interpolating said plurality of symbols at said passband IF frequency further includes:

a means for interpolating at a sampling rate four times the symbol rate, wherein said IF frequency is equal to a symbol rate frequency.

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29. (Original) The apparatus of claim 27, wherein said means for interpolating said plurality of symbols at said passband IF frequency further includes:

a means for interpolating at a sampling rate eight times the symbol rate, wherein said IF frequency is twice a symbol rate frequency.

30. (Original) The apparatus of claim 27, wherein said means for interpolating said plurality of symbols at said passband IF frequency further includes:

a means for interpolating at a sampling rate N times the symbol rate, wherein said IF frequency is equal to N/2 symbol rate frequency, N being an integer.

31. (Original) The apparatus of claim 27 further including:

a means for introducing a predistortion correction error signal in each said I and Q channels separately in order to pre-compensate for a further compression by a High Power Amplifier (HPA).

32. (Canceled)

33. (Currently Amended) ~~The apparatus of claim 32,~~ An apparatus for baseband/passband digital modulation for a data transmission system wherein a plurality of data symbols is transmitted over a transmission channel at a symbol rate; said apparatus comprising:

a means for generating a plurality of I and Q components of symbols by mapping an input bit stream comprising a plurality of digital codewords into a QAM constellation;

a means for selecting a passband or a baseband mode;

and

a means for generating an analog output signal in said passband or baseband mode;

wherein said means for selecting said passband or said baseband mode further includes the following algorithm:

if said QAM constellation includes less than 64 QAM plant points, initially selecting said passband mode until a D/A conversion speed reaches a maximum passband conversion speed, and until an output symbol rate reaches a maximum passband symbol output rate, and subsequently switching to said baseband mode in order to double said maximum passband conversion speed and to double said maximum passband symbol output rate.

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